Chief physicians' attitudes towards Early Warning Score Systems in Switzerland; Results of a cross-sectional survey

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Abstract

Rationale, aims and objectives

Early warning score systems (EWS-S) have been shown to be valuable tools to recognize otherwise unnoticed clinical deterioration (CDET) of patients. They have been associated with fewer unplanned transfers to the intensive care unit (UTICU) and lower in-hospital mortality. Little is known about their current usage in Switzerland and about the attitudes towards such tools among chief physicians. We aimed to assess the use of EWS-S in Switzerland, and the attitudes of chief physicians towards EWS-S depending on previously experienced CDET followed by UTICU, reanimation or death.

Methods

Chief physicians of medical and surgical departments from all acute care hospitals in Switzerland were asked to participate within a project that aims to develop recommendations for the use of EWS-S in Switzerland (n=118). The explorative study assessed perceived CDET, which led to UTICU, reanimation, or death of a patient, the knowledge and usage about different EWS-s and attitudes towards EWS-S in a written questionnaire. Means and percentages were used and differences were assessed with independent t-tests, chi-2 or Fisher's exact test, as appropriate.

Results

Adverse events based on CDET were reported frequently and awareness among chief physicians was high. Less than half of the chief physicians knew tools that systematically assess CDET with one fifth of responders reporting using tools at their department. Previous experiences of UTICU, reanimation or death after due to CDET were associated with more positive attitudes towards EWS-S.

Conclusions

Adverse events based on CDET of patients are frequent and the awareness of this problem is high among chief physicians. Positive attitudes were more common with previous experiences of adverse events due to CDET. Our results strengthen the argumentation that the recommendation and future implementation of EWS-S in Switzerland would be meaningful.

1) Introduction

Adverse events (AE) on hospital wards include a variety of poor outcomes, such as death, cardiac arrest, myocardial infarct, stroke, lung embolism and unplanned transfer to the intensive care unit (UTICU). In up to 85% of cases, these AEs are accompanied by slow and progressive clinical deterioration (CDET) of patients hours before the event occurs, and thus, are deemed potentially avoidable.[1,2] An analysis of the national UK database including adverse events revealed that 23% of deaths related to patient safety incidents were attributable to the failure to recognize or respond to deterioration of the patient.[3] Another study identifying root causes of UTICUs systematically concluded that half of the causes resulted from monitoring and interventional failures.[4]
To approach the problem of CDET, Rapid Response Systems (RRS) have been introduced,[5] such as in 2004, the Institute for Healthcare Improvement (IHI, US) launched the „5 million lives campaign" where five goals were included. One focused on the implementation of „rapid-response-teams" to recognize and respond to CDET of patients. This first step towards the early recognition of deterioration was followed by the implementation of "early warning scores", also known as „track-and-trigger" sytems.[6] Since then, the evidence of Early warning score systems (EWS-S) as valuable predictive tools to recognize and respond to deterioration is still growing. It has been shown that the use of EWS-S is associated with fewer UTICU and even with lower mortality.[7–13] The EWS-S are defined by first, an afferent limb, meaning the bed-side observation chart including measures of vital parameters, and second, by an efferent limb, defined as the appropriate reaction of the healthcare workers to the afferent component of the EWS-S.[8] There are a variety of EWS-S, which all in common use thresholds of vital signs to identify an upcoming deterioration of the patient.[14,15] Differences between the various EWS-S are mostly related to the inclusions of different parameters (e.g. blood pressure, pulse rate, breathing rate, Glasgow coma scale) and to different cut-off values for physiological impairment. Additionally, some EWS-S also allocate a weighting factor to each vital sign. In general, the EWS-S can be categorized in single-parameter systems, multiple-parameter systems and aggregated weighted scoring systems.[8,10]

Nowadays, the EWS-S are mainly established in the US, Australia and UK. In the UK, the use of EWS-S is mandatory, and international recommendations for the implementation of EWS-S are based on widely established scores, such as the National Early Warning Score (NEWS) from the UK or the newer Modified Early Warning Score (MEWS).[6–8,14,15] In Italy, a neighboring country of Switzerland, the NEWS, for example, has been implemented in an acute medical ward as a stratification tool on admission.[16] Switzerland has no mandatory EWS-S, and there is even a lack of knowledge of whether these systems are known and used in practice. Furthermore, for the use of EWS-S, country-specific hospital care delivery systems have to be considered. Switzerland has a high percentage of nurses

per patient and objective and systematic measures of vital parameters by an EWS-S could facilitate their work. However, implementing existing EWS-S from abroad is challenging and possibilities how it looks in practice need to be elaborated. Therefore, in 2017, the Swiss Academy of Medical Sciences decided to launch a project, which aimed to assess first, the knowledge, the need and the attitudes towards EWS-S in chief physicians. Second, the project intends to select, adapt and to pilot an existing EWS-S (i.e. MEWS) in one Swiss hospital. These two steps allow developing recommendations for the implementation, adaptions and use of EWS-S in Swiss hospitals, which is planned for the end of 2017.

As a part of this ongoing project, we addressed the first goal and assessed the attitudes of chief physicians towards EWS-S and their association with previously experienced CDET followed by UTICU, reanimation or death in particular. Chief physicians are key informants since they are well-informed about safety incidents related to deterioration in their departments and any interventions to prevent these. Since they will usually decide about implementation, their attitudes towards EWS-S are crucially important. Furthermore, we hypothesized that previous experiences with CDET of patients were associated with a more positive attitude towards EWS-S, as personal experiences with adverse events may raise awareness and willingness to implement preventive measures.

2) Methods

Survey instrument

Questions were developed by the research team based on the literature to gather basic information concerning EWS-S within the already mentioned project. Thus, questions were developed to explore the awareness of the problem of existing CDET (4 items). The answers were coded in a 4-point-Likert scale (1= fully agree, 2= rather agree, 3= rather not agree, 4= don't agree). One further question was: "How many cases have you experienced during the last 12 months, where the unnoticed or late noticed deterioration of a patient led to reanimation?" and assessed the perceived frequencies ("0 cases", "1-2 cases", "3-5 cases", "6-10 cases", ">10 cases"). In section two, it was assessed whether early warning systems are known at all and whether and which of 5 widely used early warning systems were known ("yes" and "no" answer options). Section three included one item about the use of an early warning system in the department. In section four, attitudes towards early warning systems were assessed: one scale with 5 items assessed more general statements towards early recognition of CDET of patients, such as attitudes about monitoring of vital parameters or the need to record patients systematically, when a CDET occurs (data dropped from this analysis). Another scale with10 items focused on specific attitudes towards EWS-S, and 2 further items assessed the perceived utility and necessity of EWS-S for the own clinical work. Answers were coded in a 4-point-

Likert scale (1= fully agree, 2= rather agree, 3= rather not agree, 4= don't agree). Section five consisted of demographics, more precisely, of hospital characteristics. All items included a „don't know" response option.

The German questionnaire used in this analysis was pre-tested in July 2016 by 8 senior doctors from medical and surgical departments. Only minimal changes concerning the wording of the questions were performed. The final version was then translated by professional translators into French and Italian. Native bilingual speakers from hospitals (one French/German and one Italian/German speaker) checked the translations.

Sample

For the present analysis we used data from questionnaires sent to the chief physicians of medical and surgical departments from all acute care hospitals. Contact data were provided by Swiss medical societies and additionally gathered by an internet search. Chief physicians were chosen for the study as they are in charge of deciding on the implementation of EWS-S. In October 2016, the chief physicians received an email with an individual link to the online survey (n=417). After two reminders, 137 fully completed questionnaires were returned (participation rate 33%). We excluded questionnaires with missing information on the past occurrence of UTICU, reanimation or death of the patient due to unnoticed or late noticed CDET (n=19), resulting in a final sample of 118 participating chief physicians. According to Swiss Law, this survey did not require formal approval by an ethics committee.

Statistical analyses

Means with standard deviations (SD) and percentages were used for descriptive statistics. To test for differences in attitudes towards EWS-S between chief physicians with and without previous experiences of UTICU, reanimation or death due to CDET, independent t-tests, chi-2 or Fisher's exact tests were used as appropriate. All analyses were performed with Stata/IC 14.2 (College Station, Texas). $P<0.05$ was considered statistically significant (one-sided).

3) Results

Most of the chief physicians worked in a large (87%) and public (83%) hospital with permanent presence of physicians (86%). For more descriptive characteristics see Tab. 1. In the past 12 months, 88% of the chief physicians experienced at least one CDET resulting in an UTICU, 40% experienced reanimation and 36% patient death (Fig. 1). Awareness towards the problem of CDET is described in

Table 2. CDET is perceived as a general problem by over 90% of the chief physicians, and by 82% as a problem in their own clinical work.

Less than half of the chief physicians knew tools that systematically assess CDET, and the use of such tools was reported by one fifth of the chief physicians. The MERIT and MEWS were the most widely known tools ("yes"/"heard about it") and were reported by 45% and 38% of the physicians, followed by CART (29%), SEWS (29%), and ViEWS (20%). Figure 2 depicts the frequencies of the known tools, stratified by the answer categories. Table 3 reports attitudes towards EWS-S for the total group and related to prior experience of at least one case of UTICU, reanimation or death due to CDET in the past 12 months vs. no such an experience. Over 90% of the chief physicians considered EWS-S a good measure for improving patient safety and to systematically recognize CDET. Furthermore, two third agreed that EWS-S should be used systematically on all wards, although nearly half of the physicians considered EWS-S as too time-consuming and as increasing the workload of nurses disproportionately One third considered EWS-S unnecessary in attentive and well-trained staff. A vast majority (80%) agreed that EWS-S guide nurses' decisions whether to inform doctors about CDET and also to guide doctors to evaluate the information provided by nurses correctly and respond appropriately.

In summary, the mean average scale of the attitudes towards EWS-S was 2.93 (95% Confidence Interval [CI] 2.82-3.04) and did not differ between the groups with and without prior experiences of UTICU (p=0.13; data not shown). However, statistically significant differences between groups with and without previous experiences of UTICU, reanimation or death were observed in single items, most items differed significantly in previous experiences with death, followed by reanimation and UTICU (Tab. 3). Detailed information concerning the single items is available in Tab. 3. It was observed that chief physicians with experience of UTICU, reanimation or death were significantly more likely to agree to the use of EWS-S and to report a need to implement the EWS-S in their ward compared to those without experience (Tab. 4).

4) Discussion

This study is the first to provide an overview about the current use of EWS-S in medical and surgical departments from acute care hospitals in Switzerland and about attitudes of chief physicians towards EWS-S and their association with previously experienced CDET followed by UTICU, reanimation or death in particular.

In our study, most of the chief physicians were aware of unnoticed CDET of patients being a patient safety problem, not only in general, but also in their own clinical work. Nevertheless, less than half of responders knew tools that systematically assess CDET and only a few used such a tool systematically

in their clinic. In contrast, in the UK, EWS-S were implemented and recommended for use in all adult patients in acute hospitals since ten years. They were first modified (MEWS),[10] than standardized (SEWS)[17] and finally, a standardized national EWS (NEWS) was developed and implemented in UK hospitals.[18]

Most of the chief physicians had positive attitudes towards EWS-S, such as EWS-S being good measures for improving patient safety and useful tools to systematically recognize CDET in patients. This positive attitude may be a result of the growing evidence that EWS-S are associated with less UTICU and even lower mortality.[19–21] However, it has to be pointed out that there is a large a variety of existing EWS-S and use in different populations, thus, as evaluated in a systematic review, resulting in only a trend towards less UTICU and lower mortality.[7,22,23]

As we hypothesized, measures of attitudes towards EWS-S were more positive in chief physicians with previous experience of UTICU, reanimation or death compared to physicians without such experiences, with differences being statistically significant in some items. For example, physicians with previous experiences of UTICU or reanimation were more likely to agree that EWS-S are necessary on wards with daily assessments of vital parameters compared to the chief physicians without these experiences. While the assessment of vital parameters in patients is common, the EWS-S additionally includes an efferent limb that triggers a predefined reaction. It can support nurses' decisions whether to inform doctors about the CDET of a patient, and guide doctors to evaluate the information provided by nurses correctly and to respond appropriately. The different attitudes in the two groups of physicians were probably formed by their respective previous experiences. According to psychological theories looking at attitude changes, emotional, cognitive and motivational processes (e.g. dissonance theory,[24] balance theory[25] and heuristics[26,27]) of potentially preventable adverse events, one's judgment about the cost/benefit relationship is affected by previous experiences. Based on the cognitive dissonance theory, physicians might seek psychological consistency between their attitudes and reality. Experience of UTICU, reanimation or death may thus render attitudes towards a more favorable view of EWS-S. Furthermore, chief physicians with previous experiences may also be more aware of and more sensitive towards the positive aspects of EWS-S.

For single items concerning the reported attitude towards EWS-S, opinions were divided among the chief physicians with and without previous experiences, such as for the attitude towards the time-consuming effect of EWS-S and towards the expected increasing workload of nurses. It has been observed in a survey conducted in Ireland that nurses didn't experience a higher workload after the implementation of EWS-S.[28] However, a literature review evaluating factors that impact the nurses' behavior to call a rapid response team came to the conclusion that nurses feared a higher workload when calling a rapid response team because of CDET of patients.[29]

In general, nurses abilities to recognize and respond to patient's deterioration are of great value to reduce adverse events,[30] and with EWS-S, a framework is given, which enables to respond appropriately and promptly when CDET of patients occurs.[31] However, up to our knowledge, little is known about attitudes toward EWS-S among different groups of healthcare workers. A study conducted in one Irish hospital found that attitudes towards the NEWS were more positive in nurses and consultants compared to interns and senior doctors.[32] Another study addressed the attitudes of nurses from an acute medical unit in England towards MEWS and the nurses' attitudes were positive in the sense that the MEWS was considered a good tool to alert nurses and medical staff to CDET and helped to define the strength of illness of the patient as well as to guide the treatment. However, it was stated that there are some difficulties in first, calculating the score and second, in the appropriate reaction of the medical staff, also when the score was high.[33]

Altogether, recent research concluded that the future potential of EWS-S lies in the prediction of CDET and UTICU by electronic systems which aim to automatically alert trained specialist, but that the variables to be included in the prediction model have to be evaluated more detailed first.[23] Therefore, it has to be pointed out that not only scores systems, but also the subjective risk estimation, which may also be influenced by cognitive errors, is of importance for recognizing CDET.[23,34] Besides considering these aspects for the development of recommendations for the use of EWS-S in Switzerland, it also has to be taken into account that the health care delivery system differs from other countries, and therefore, existing EWS-S may have to be adapted. In summary, the development of recommendations for the implementation of EWS-S should allow nurses to decide whether to call a doctor due to objectively measured criteria. Future goals for practice should be developed after the implementation of the recommendations.

Strengths and limitations

Our study has an explorative character as we are the first to look at the knowledge about and at the use of EWS-S in Switzerland. A main limitation is due to the explorative study design. Thus, the questionnaire was developed based on expertise without using psychometric testing. It assessed the chief physicians' self-reported perceptions. Furthermore, the statistical analyses remained on a descriptive level.

Up to our knowledge, there is no study yet looking at the attitudes of chief physicians towards EWS-S and evaluating whether they depend on previous experiences of UTICU, reanimation or death due to CDET of a patient. Studies investigating perception, knowledge and attitude of professionals to support practical implementation of such tools and their organizational impact on wards can be

useful for redesigning processes of care, raising awareness on the problem of CDET and disseminating tools for prevention and appropriate management of CDET.
Thus, knowing the attitudes about and frequencies of CDET followed by adverse events, is an important prerequisite for the recommendation and implementation of EWS-S in Swiss hospitals.

We conducted the study with chief physicians from medical and surgical departments from all acute care hospitals in Switzerland as they are in charge for new implementations in their clinics, and thus, their attitudes towards EWS-S need to be considered. However, it cannot be excluded that some chief physicians were missed as Switzerland does not provide an official list of chief physicians. Furthermore, a non-response bias cannot be excluded due to the low response rate. Due to the limited number of physicians, statistical analyses were restricted to frequencies (percentages) and chi-2 test.

Conclusion: Adverse events based on CDET of a patient are frequent and the awareness of this problem is high in the chief physicians, but not the use of EWS-S. Attitudes towards EWS-S are mainly positive and previous experiences with unnoticed CDET of a patient resulting in UTICU, reanimation or death were associated with a more positive attitude towards EWS-S. Our results support the argumentation towards the implementations of recommendations for the use of EWS-S in Switzerland.

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The authors declare that they have no competing interests.

Authors' contribution

All authors have made substantial contributions. OF and DS designed and conducted the study. AR performed the statistical analyses and prepared the first draft of the manuscript. All authors contributed to the intellectual content, revised the manuscript and finally approved the final version.

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7) Figure legends

Fig. 1: Frequencies (%) of cases of unnoticed clinical deterioration of a patient (CDET) during the past 12 months, which led to unplanned transfer to ICU (UTICU), reanimation or death of the patient

Fig. 2: Frequencies (%) of the chief physicians' knowledge about existing early warning score systems (EWS-S)

8) Tables

Tab. 1: Hospital characteristics of the participating chief physicians (n=118)

	n	Total %
Hospital size		
< 500 beds	103	87.3
≥ 500 beds	15	12.7
Hospital status		
Public	98	83.1
Private	20	17.0
Clinical area		
General internal Medicine	52	44.1
Surgery	53	44.9
Other	13	11.0
Presence of physicians		
24h	102	86.4
Not permanently	16	13.6
Physicians working on-call duty		
Yes	88	74.6
No	30	25.4

Tab. 2: Awareness of the problem with unnoticed clinical deteroriation of the of the patient (CDET) and knowledge about early warning score systems (EWS-S)

	Total %
The CDET is a problem for patient safety	
Fully agree/ rather agree	93.2
I know that CDET is a problem from my practical work	
Fully agree/ rather agree	82.1
In our clinic there is no problem with the deterioration	
Fully agree/ rather agree	36.5
Tools for a systematically assessment of CDET are known to me	
Yes	43.2
No	40.7
Don't know	16.1
Are you using such a tool systematically in your clinic?	
Yes	20.3
No	75.4
Don't know	4.2

Tab. 3: Attitudes towards early warning score systems (EWS-S), stratified by cases during the past 12 months, in which the unnoticed clinical deterioration of the patient (CDET) led to an unplanned transfer to ICU (UTICU), reanimation or death

		Total n		No UTICU		At least one UTICU		No reanimation		At least one reanimation		No death		At least one death	
Early warning score systems …		n	%	n	%	n	%	n	%	n	%	n	%	n	%
... are a good measure for improving patient safety.	agree[1]	89	91.8	10	83.3	79	92.9	50	87.72	39	97.5	54	88.5	35	97.2
	don't agree[1]	8	8.3	2	16.7	6	7.1	7	12.28	1	2.5	7	11.5	1	2.8
p-value[2]							*0.257*				*0.135*				*0.251*
… are useful tools to systematically recognize deterioration of the general condition.	agree	87	91.6	10	83.3	77	92.8	50.0	87.72	37	97.4	51	86.4	36	100.0
	don't agree	8	8.4	2	16.7	6	7.2	7	12.28	1	2.6	8	13.6	0	0.0
p-value							*0.266*				*0.139*				***0.023***
… should be used systematically on all wards.	agree	67	67.0	9	75.0	58	65.9	40	67.8	27	65.9	41	64.1	26	72.2
	don't agree	33	33.0	3	25.0	30	34.1	19	32.2	14	34.2	23	35.9	10	27.8
p-value							*0.746*				*0.839*				*0.405*
… are too time-consuming to use.	agree	37	48.7	7	77.8	30	44.8	21	51.22	16	45.7	23	48.9	14	48.3
	don't agree	39	51.3	2	22.2	37	55.2	20	48.78	19	54.3	24	51.1	15	51.7
p-value							*0.082*				*0.632*				*0.955*
… are not necessary on wards with daily assessments of vital parameters.	agree	30	29.7	7	58.3	23	25.8	23	38.33	7	17.1	23	34.9	7	20.0
	don't agree	71	70.3	5	41.7	66	74.2	37	61.67	34	82.9	43	65.2	28	80.0
p-value							***0.021***				***0.022***				*0.120*
… increase the work-load of nurses disproportionately.	agree	33	41.3	4	44.4	29	40.9	20	44.44	13	37.1	26	49.1	7	25.9
	don't agree	47	58.8	5	55.6	42	59.2	25	55.56	22	62.9	27	50.9	20	74.1
p-value							*1.000*				*0.510*				***0.047***
… are too imprecise/unreliable for the recognition of clinical deterioration of patients.	agree	12	16.9	4	40.0	8	13.1	10	25.64	2	6.3	11	25.6	1	3.6
	don't agree	59	83.1	6	60.0	53	86.9	29	74.36	30	93.8	32	74.4	27	96.4
p-value							*0.058*				***0.029***				***0.014***

… are unnecessary in attentive and well-trained staff.	agree	31	31.0	6	50.0	25	28.4	23	38.98	8	19.5	25	38.5	6	17.1
	don't agree	69	69.0	6	50.0	63	71.6	36	61.02	33	80.5	40	61.5	29	82.9
p-value							*0.129*				***0.038***				***0.028***
… guide the decision for nurses whether to inform doctors about the clinical deterioration of a patient.	agree	73	78.5	7	53.9	66	82.5	41	73.21	32	86.5	44	73.3	29	87.9
	don't agree	20	21.5	6	46.2	14	17.5	15	26.79	5	13.5	16	26.7	4	12.1
p-value							***0.020***				*0.127*				*0.121*
… guide doctors to evaluate the information provided by nurses correctly and to respond appropriately.	agree	73	81.1	8	61.5	65	84.4	41	75.93	32	88.9	46	76.7	27	90.0
	don't agree	17	18.9	5	38.5	12	15.6	13	24.07	4	11.1	14	23.3	3	10.0
p-value							*0.051*				*0.171*				*0.160*

[1] agree= fully agree/ rather agree, don't agree= rather don't agree/ don't agree

[2] p-Value: Fisher's exact test if cells contain number smaller than 5, else chi-2 test

Tab 4: Agreement towards and evaluation about the necessity of the implementation of an early warning score systems (EWS-S)

	no UTICU		At least one UTICU		No reanimation		At least one reanimation		No death		At least one death	
	n	%	n	%	n	%	n	%	n	%	n	%
Agree for the use of EWS												
agree[1]	8	61.5	77	90.6	48	81.4	37	94.9	51	19.1	34	97.1
don't agree[1]	5	38.5	8	9.4	11	18.6	2	5.1	12	19.1	1	2.9
p-value[2]				***0.004***				***0.047***				***0.019***
Necessity of the implementation of EWS												
necessary[3]	3	23.1	74	81.3	39	63.9	38	88.4	44	62.9	33	97.1
not necessary[3]	10	76.9	17	18.7	22	36.1	5	11.6	26	37.1	1	2.9
p-value[2]				***<0.001***				***0.005***				***<0.001***

[1] agree= fully agree/ rather agree, don't agree= rather don't agree/ don't agree

[2] p-Value: Fisher's exact test if cells contain number smaller than 5, else chi-2 test

[3] necessary= necessary/ rather necessary, not necessary= rather not necessary/ necessary